

A N  
**EXPLICATION**  
**OF THE DIAL SETT UP**  
**IN THE KINGS GARDEN**

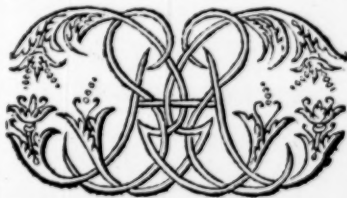
AT LONDON, an. 1669.

**IN WHICH VERY MANY SORTS OF**  
Dyalls are contained ; by which, besides the Hou-  
res of all kinds diversly expressed , many things al-  
so belonging to Geography , Astrology , and AC-  
tronomy, are by the Sunnes shadow made visible  
to the eye.

*AMONGST WHICH, VERY MANY DIALLS, ESPECIALLY  
the most curious, are new inventions , hitherto  
divulged be None.*

**ALL THESE PARTICULARS ARE SHORTLY,**  
yet clearly sett forth for the common good ,

*By the Reverend Father FRANCIS HALL, otherwise LINE,  
of the Society of JESUS, Professor of Mathematicks.*



**PRINTED AT LIEGE,**

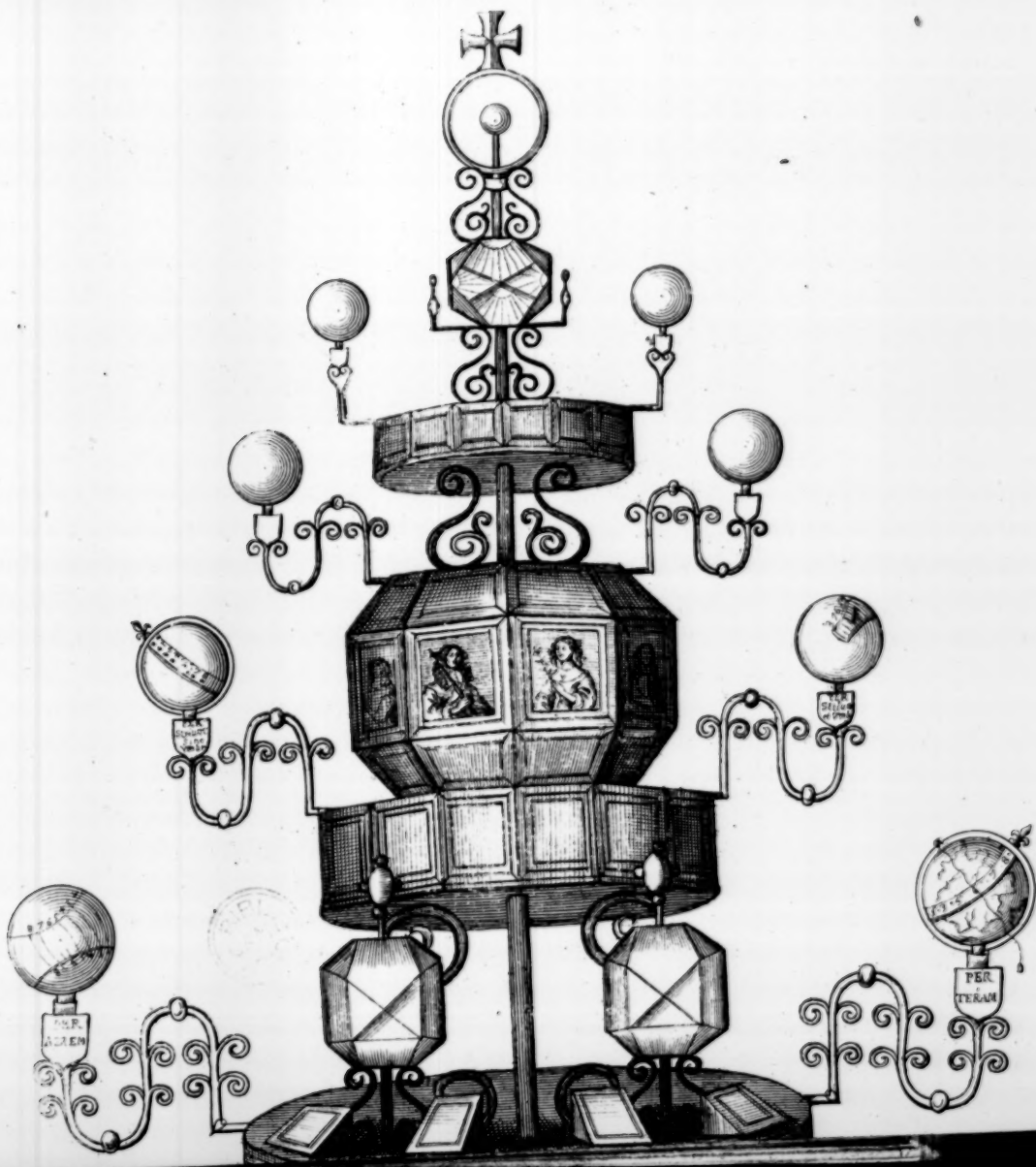
By **GUILLAUME HENRY STREEL**, in the Yeare of our  
lord 1673.

*Superintendens Permissu,*

70:03



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A

# BRIEF EXPLICATION

## OF THE PYRAMIDICALL DIALL

*set up in his Majestey Private Garden  
at white hall July 24. 1669.*



THE Dyall being placed upon a Pillar by his Majestey order, in the Privy Garden : it was intimated unto me by divers Worthy persons as a thing very Expedient, that an Explication should be published, of the use, of the severall Dyalls there containd. For although to divers of them were added a verse or two Explicating how the houre, &c. was to be found by them yet in regard many of them were new, and not to be found in any Author : and others belonging to Astronomy, Cosmography, &c. not so easily conceived by all, they judged very Expedient a Declaration there of should be sett forth whereby such as came daily to see it, might receive more satisfaction.

Heere upon, havinge soone after the setting up of the Diall, left London, and being arrived at my lodging in the Country, I began the sayd Explication : and being much desirous to adde yet some further ornament to the Diall already placed, I began the making of fowre water Dyalls to be placed at the 4.

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Cor-

Corners of the Pyramidicall Dyall in a cōpetent distance from the same. To this undertaking I was moved, as well, by the opportunity of à fountayne in the Privy Garden, soe neere the Dyall : as also for that Experience had taught me, that such Dialls, as formerly I had made to shew the Howre in severall ways by water, were for their rarity and novelty noe lesse pleasing to the beholder, then the rest.

Being now very busy in these two Employments, and having towards the middle of winter made à considerable progresse therein : I receaved à letter from à friend at London, wherein he told me, that the Diall, for want of à cover (wich according to his Majestyes gracious order, should have been sett over it in the winter) was much endamaged by the snow-lying long frozen upon it; and that, unlesse à cover were provided ( of which he saw little hope ) another or two such tempestuous winters, would utterly deface it. Heereupon I layd aside as well the sayd Explication, as these Waters Dyalls, it seeming to noe purpose, an Explication should come forth, of the Use of the Diall, when it was now rendred Uselesse. Which resolution being understood by some of those worthy persons, who before, had urged for the publishing the sayd Explication they judged that not withstanding the Diall it self should be rendred Uselesse; yet the sayd Explication, was not to be omitted : since thereby would be given occasion to some other skillfull Mathematicien ( of which we have many in England ) to sett up another in place thereof both more specious and durable, and adorned with more variety of invention.

This reason suting well with the desire I formerly had, of adorning his Majestyes Gardē with some curiosity that might in its kind surpasse what might else where be found, I resolved to take in hād agayne the sayd Explication. Which that it may the better

better be performed, I will first enumerate the parts or peeces of which the whole Diall consists, and then descend to the Dialls described on each particular peece.

## CHAPTER I.

*Of the severall parts of this Diall: and of the Dialls described on each part, in generall.*



His Diall Standing on a Pillar or Piedestall of stone, consists chiefly of 6. parts or peeces, one lesse then another, and placed one above another in forme of a Pyramis, as you see in the precedent page.

### *Of the first Peece.*

**T**He first and largest of these 6. Peeces, or base of the sayd Pyramis, is a round Table of about 40. inches in Diameter: and some 8. or 9. inches in thicknes: The Edge whereof is cutt into 20. Equall playnes, which being made hollow like soe many boxes of an inch deepe, are covered each of them with a cleare polishd glasse: and on the inside of each glasse is described a Dyall: whereof some of them shew the Hour accordinge to the Ancient or lewes Manner of counting the Hours: Others according to the counting used by the Babylo-nians: Others according to the Italians: Others according to the way of counting used by Astronomers: and lastly others shew what Hour it is according to our usuall and ordinary way of counting the Hour, used in most parts of Europe. These

20. Dyalls thus described on the Edge of this Table or first peece, are all verticall Declining Dyalls: Whose Style or Gnomon, is Eyther à Lions paw, or Unicornes Horn or such like relating to his Majestyes Armes, and paynted on the bottome of the Box, as shall be sayd in the next Chapter.

Moreover upon the upper part of this Table, are placed 8. Reclining Dyalls, all made hollow, and covered with polishd, glasse like the former: but differ cheefly in this that they shew only the usuall Hour in different wayes: one of them shewing the Hour by the shade of the style falling upon the Hour-lines: another by the shade of the Hour lines falling upon the style: à third without any shade Eyther of Hour lines or style, &c.

Upon this Peece stand also 4. Globes, cutt into severall Panes: upon one of which Globes are described severall Dyalls belonging to Geography: on an another, Dyalls belonging to Astronomy: the third Dyalls shewing severall things appertayning to Astrology, as what planet raigns every Hour: the Horoscope: Aspects of the sunne with the stars, &c.

There are also belonging to this peece, and yssuing out of the sides therof towards the East, West, North and South 4. Iron branches supporting Each of them à glasse Boule, which shew the Hour, in 4. different wayes to witt by the 4. Elements as shall heereafter be sayd.

*Of the second Peece.*

**T**He second Peece of the Pyramis is also a round Table, almost like the former, but somewhat lesse, having only 30. inches in diameter, and about in thicknes. It stands upon the first, held up by 4. iron supporters. The Edge or circumference of this Table is cutt into 16. Equall Playnes, all made

de hollow, and covered with glasse, like those of the first Table. But they differ from them in this, that heere the Dyalls are not described on the glasse covers, but on the bottome of the boxes: neyther do they shew the Hour, but the different Rising of the more remarkable starres, according to the three manner of Risings observed by Astronomers, to witt, the Cosimicall Rising, the Acronycall, and the Heliacall, as shall be declared heereafter, when we speak of the Dyalls of this second peece. The style to each of these Dyalls is a little starre paynted upon the inside of the glasse cover, the better to keepe it from the weather.

Out of the sides of this Peece yssue also 4. Branches towards the East, West, North and South, and carry on each of them a glasse Boule to shew the Hour, like those of the first Peece, but in a different way. For one of them shews the Hour by a style without a Shadow: another shews it by a Shadow without a style, &c. whereas those of the first Table shew it by the 4. Elements, Fire, Water, Aer and Earth, as shall be sayd in their due place.

On the upper part of this Table are placed 8. Reclininge Playnes: 4. where of are covered each of the with a plate of looking-glasse, on which the Hour lines, or style of a Dyall being paynted, are reflected upon the bottome inclining playnes, of the Third peece, and there shew the Hour, as shall be presently sayd. The other 4. have also Dyalls upon them, which are to be seen each of them in a looking glasse placed upon the sayd bottome inclining playnes, of the Third peece: of which wee shall now speak.

*Of the Third Peece.*

**T**HE Third Peece of this Pyramidicall Dyall, is a great Hollow Globe, of about 24. inches in diameter: and is placed immediatly without any supporter, upon the second peece. The superficies of this Globe is cutt into 26. playnes: two whereof being octogones serve for top and bottome. The rest are divided into 8. Equall Reclining playnes. 8. Equall inclining playnes: and 8. Equall verticall or upright playnes. These playnes are all of them made hollow like those of the first and second peece. The incliners are not covered with glasse, but left open, that they may the better receive and shew the Dyalls reflected, as hath been sayd, from the second peece.

Two of the 8. upright playnes looking toward the North, have noe bottomes: but are covered only with cleare glasse, as serving only for windows to looke in to the Globe, and behold there the Dyals described on the Globe, which are seene as well without the same, as within. The other 6. have not only Each of them a cover of cleare polishd glasse with a Dyall described thereon, like those of the first peece, but have also a glasse for their bottome; which glasse is thinnely paynted over, with white coulour, to the end the shade of the Hour lines drawn upon the cover, may be seen as well, within the Globe as without. On these bottome glasses are drawn severall pictures, holding eyther a Scepter, or a Troncheon, or the like, the end whereof poynts the Hour, you look for.

Two also of the Recliners looking towards the north, have only a glasse cover serving for a window to look into the Globe. The other 6. have double glasse, like the former. Their Dyalls are some drawn upon the cover, others upon the bottome:



bottomer: but all soe contrived, that the Hour cannot be known by them, but only by looking within the Globe.

More over from the top of this Globe yssue 4. iron Branches towards the 4. parts of the world, each of them carrying a glasse Boule, proportionably lesse then those of the first and second peece: on which Boule, are also Dyalls described, but different from the former shewing the Hour according to the severall ways of counting the Hours. These Boules are paynted on the inside with thick coulour to keep out the light, except a little place which is left cleare like a starre for the sunne beames to passe through and shew the Hour: and the place also where the Hourlines are drawn, is only painted on the outside thinnely with white coulour, that the light of the sunne passing through the sayd starre may be seen, and shew the Hour.

*Of the fourth Peece.*

**T**He fourth peece standing on the afore sayd Globe, and held up by 4. iron supporters, like to those which hold up the second peece, but proportionably lesse, is also a round Table of about 20. inches diameter, and 6. in thicknes. The Edge of this Table is cutt into 12. Equall superficies, not playne, as hitherto, but concave like soe many concave semicylinders: On each of which is described a Dyall, which shews the usuall Hour by the shade of a Flower de luce fixed at the top of each semicylinder.

From the top of this Table yssue forth 4. iron Brâches, carrying each a glasse Boul just like those of the first, second and Third peece, though proportionably lesse. The Dyalls described on these glasse Bools differ from those of the Third peece, not only because they shew only the usuall Hour; but also because  
 heere

hee the Hourlines are al left cleere for the sunne beames to passe through: that by soe passing they may exhibite the like Dyall on the opposite side of the Boule: which side is for that purpose, thinnly paynted over with white coulour, that the sayd Hours may be seen, and shew the Hour by their passing over à little starre paynted in the middle thereof.

*Of the fifth Peece.*

**T**He fifth peece standing upon the 4<sup>th</sup>. and held up also by 4. iron supporters, is à Globe of about 12. inches diameter: whose superficies is cutt into 14. playnes, 8. whereof are Triangles Equall and Equilaterall, the other 6. are Equall Squares. The Dyalls described on these playnes shew only the usuall Hour by the shade of a Flower de luce fastened to the top or bottome of each playne.

*Of the last or Highest Peece.*

**T**He Highest peece or top of the Pyramis, is à glassè Boule of some 7. inches diameter, standing upon à foote of iron placed on the middle of the fift peece. The north side of this Boul is thinnly paynted over with white coulour, that the shade of à little golden Ball, that is placed in the middle of the Boule may be seene to passe over the Hourlines, which are drawn upon the sayd white coulour, and note the Hour. The Boule is included between two circles of iron gilded, with à crosse on the top. And thus much concerning the parts of this Pyramidicall Dyall, in generall.

To which may be added, that the first 4. peeces have all their sides covered with little plates of black glassè, fastly cemented to the sayd peeces, except those places whereon the Dyalls



Dyalls are drawne : which being ; as is sayd , covered also with plates of polished glasse , there appeares almost nothing on the outside of this Dyall , but glasse : which for the greater ornament of the Dyall the angles or corners, where those little plates of black glasse are joyned together, are gilded , as almost all the iron work of the Pyramis , as well supporters , as Branches,style,&c. are eyther wholly, or as much as serves for ornament, covered in like manner with gold.

## CHAPTER II.

*Of the 20. Verticall Dyalls described on the Edge of the first Peece.*

**B**Y what is sayd in the precedent Chapter of the first Peece it appeares, that besides the Dyalls described on the 4. great Globes, which stand on the sayd first peece: there are 32. Dyalls belonging thereto : Viz. 20. Verticall, or *Upright* Dyalls: 8. Reclining Dyalls: and 4. Sphæricall Dyalls. Of the 20. Verticalls, we shal now speak in this Chapter: of the 8.

Recliners in the next : and of the 4. Sphæricall in the 4<sup>th</sup>. Chapter.

These Verticalls being made hollow Boxes , ( as is sayd ) covered with glasse: the Hour-lines of each of them are drawn upon the glasse: and the style ( which is eyther à Lions paw, or Unicorne's Horne, &c. ) is paynted on the bottome of the box. Whence it followes , that whereas in the ordinary way of making sunne Dyalls, the shade of the style or Gnomon passes over the Hour-lines: heere on the contrary the shade of

the Hour-lines passe over the stile. Soe that whereas before, when the sunne did not shine, you saw nothing in the bottome of the box, but a paynted Lion or Unicorne, &c. Soe now as soone as the sunne shines, you may behold there a perfit Dyall with all its lineaments and numbers exactly described, and just like the other drawne upon the glasse cover: as being only the shade thereof caused by the sunne beames passing through the sayd glasse. Which shady Dyall being moved by the motion of the sunne from one part of the sayd bottome to another, shews by passing over the paw of the Lion, for example, the same Hour of the day, which in the ordinary Dyalls is shewed by the shade of the stile passing over the Hours.

These 20. Dyalls, thus deseribed are not all of the same kind, nor shew the time of the day all in the same manner, but in very different wayes, according to the different wayes of numbring the Hours used by severall sorts of people: Some beginning to count their Hours from sunne Rising: others from sunne-setting: others from noone, and others from Midnight. And agayne, of those, who count from sunne Rising: some count allwayes 12. Hours from sunne Rising till sunne setting for the day: and as many from sunne setting till sunne Rising for the night: whether the dayes or nights be long or short. And these kind of Hours are therefore called the unequall Hours, as being longer or shorter according as the dayes are now longer, now shorter.

Others there are, who also count from sunne Rising, but continue the number till next sunne Rising: counting allwayes from sunne Rising till sunne Rising 24. Hours. According to which, it is allwayes 24. a clock at sunne Rising.

Other on the contrary count allwayes 24. Hours from sunne setting till next sunne setting: soe that when sunne setts, it is allwayes 24. a clock.

Others

Others count also 24. Hours, but begin at Noone, and End at next Noone; and with these it is allways 24. à clock at Noone.

Lastly others beginn at Midnight, and count 12. Hours till Noon: and then 12. more till Midnight: and according to these, it is allways 12. à clock, at Noone and at Midnight.

The first of these 5. ways, and which divides the space between sunne Rising and setting into 12. Equall parts, making thereby the Hours unequall (as is sayd) that is longer in summer then in winter, is the Most ancient of all; and are theretore called *Hora Antiqua*. They were anciently used by the Iewes, at is manifest by divers places of holy writt. Soethat when in S. Mathew chap. 27. v. 54. it is sayd to *have been darknes* (at our Saviors passion) *from the sixth Hour till the Ninth*: it is to be understood according to our manner of reckoning the Hours: that there was darkores from Noon till about 3. à clock after dinner: since according to this counting by unequall Hours: it is allways at Noon 6. à clock, and 12. at sunne sett. And for this reason, they are called heere in the Dyall *Hora antiqua* (five *Judaica*). They are also called *Hora Planetaria*: because the Auncient Astrologers supposed à new Planet to raigne in each of these unequall Hours.

The second way of counting 24. Hours from sunne Rising till sunne Rising, is used by the Babylonians, and these Hours are therefore called *Hora Babylonica*: the Babylonian Hours.

The third way of counting 24. Hours from sunne sett to sunne sett, is used chiefly by the Italians: and therefore these Hours are called *Hora Italica*: the Italian Hours.

The fourth way counting also 24. Hours from Noone or Midday till next Midday, is used by Astronomers in calculating the places and positions of the starres and Planets in the Heavens, &c. And are therefore called *Hora Astro-*

*nomica* : Astronomicall Hours.

The fift and last way : which counts 12. Hours from Midnight to Noone, and as many from Noone to Midnight, is used as well in Most parts of Europe, as heere in England : and is therefore styled in the Dyall, the usuall or vulgar way : and the Hours, *Hora Vulgares*; the vulgar or usuall Hours.

Now there being (as hath been sayd 20. Dyalls placed on the Edge of this first peece : there is allotted in the Dyall to each of the 5. sorts, 4. Dyalls : which are soe disposed, that at any time of the day you may behold the time of the day represented in every of those 5. manner of wayes, And that they may be the better conceaved it seemed good to sett downe one of each sort, in the next Page : which by their titles are easily known.

FIG. 1. For 1. those 4. whose title is, *Per horas numeratas, ab ortu Solis, more antiquo, sive Judaico*, and have à Red Lion paynted on the bottome, shew by the shady Dyall passing over the paw of the Lion, what à clock it is sayd to be at Whitehall, according to the Ancient or Iewes account.

FIG. 2. 2. Those 4. whose title is *Per Horas numeratas ab ortu Solis, more Babylonico*, and have paynted on their bottome à Harpe with à Scepter, shew by the shady Dyall passing over the top of the Scepter, what à clock it is at Whitehall according to the Babylonian way of the counting the Hours.

FIG. 3. 3. Those 4. whose title is, *Per Horas numeratas ab occasu Solis, more Italico*, and have on their bottome à Flower de luce, shew by the like shady Dyall passing over the top of the Flower de luce, what à clock it is there according to the Italian account.

FIG. 4. 4. Those 4. whose title is, *Per Horas numeratas à Meridie, more Astronomico*, and have on their bottome à Unicorn, shew by the often mentioned shady Dyall, what à clock it is to be sayd to be according to the count used by Astronomers.

Lastly

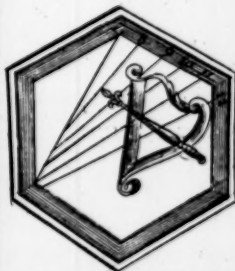
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Per Horas Numeratas ab ortu  
solis more Antiquo Iudaico



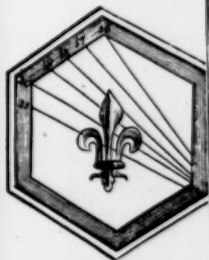
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Per Horas Numeratas ab ortu  
solis more Babylonico



3

Per Horas Numeratas  
solis more Italico



4

Per Horas Numeratas a Meri-  
diano more Astronomico



5

Per Horas Numeratas a Meri-  
diano more Vltimo



Fig. 6. Lastly, these 4. whose title is, *Per horas numeratas à Meridie & media nocte, more usitato*, and have on the bottome à Lion paynted in its naturall coulour, shew by the shady Dyall, passing over the Lions paw, what à clock it is according to the usuall and ordinary way of reckoning the Hours.

Soe that for example: yf at the beginning of July ( at what time the sunne risès at 4. clock and setts at 8.) I find by looking on the usuall Dyall, that it is just 8. à clock in the mórning I shall find à the same time by the Ancient or Judaicall Dyall, to be just 3. à clock: by the Babylonian to be 4. by the Italian 12. and by the Astronomicall to be 20. and thus much for the use of these 20. Verticall Dyalls.

Now the reason of their difference from the ordinary Dyalls which shew the Hour by the shade of the style passing over the Hour-lines is, that the sunne being moved in the same manner, whether the shade of the Hour-lines be moved over the style, or on the contrary, the shade of the style moved over the Hour-lines the self same effect, in order to the shewing the Hour, must needs follow both wayes: since the Hour-lines are noe other then the sections, which the playnes of the Hour circles in the Heavers make with the playne of the Dyall: in each of which playnes, the style also is, as insensibly differing from the Axis of the world.

From whence it follows, that the afore sayd Dyalls beyng made according to the ordinary way of making the like verticall declining Dyalls, are to be inverted, to the End they may shew the Hour.



## CHAPTER III.

*Of the 8. Reclining Dyalls Standing upon the first Peece.*

**T**he 8. Reclining Dyalls, being also made hollow, and covered with glasses like these 20. verticalls we now spoke of, shew only the usuall Hour; but performe it in different, or rather contrary wayes one to another. For of those 4. which stand upon the south part of the Table; one shews the Hour by the shade of the style passing over the Hour-lines. Another on the contrary shews it by the shade of the Hour-lines passing over the style. A third shews it both ways; as well by shade of style passing over Hours, as shade of Hours passing over style. The fourth shews the Hour without shade cyther of style or Hourlines.

In like manner, of those 4. which stand on the North part of the Table, in one you see the Hour-lines, but noe style. In another you see the style, but noe Hours. In a third you see neyther style nor Hours, unlesse the sunne shine, as shall be declared by and by. In the fourth, you see indeed both Hours and style: but in a different way from what hath been hitherto practised: for heere you behold the style in the same superficies with the Hour-lines. Whereas in the common practise of Dyalling, the style is allwayes lifted above the superficies in which are the Hour-lines, to the end it may cast its shade upon them. And thus much of these 8. Reclining Dyalls in generall. We shall now speak of them in particular and first.

*Of those*

*Of those 4. Which stand upon the south part of the Table.*

FIG. 6. **T**He first of these 4. whose title is, *Per umbram styli*, and shews, (as is sayd) the Hour by the shade of the style passing over the Hour-lines, hath upon the glasse cover, paynted à little starre : which serves for style: and on the bottome are drawn the Hour-lines: over which the shade of the sayd starre passing shews the Hour.

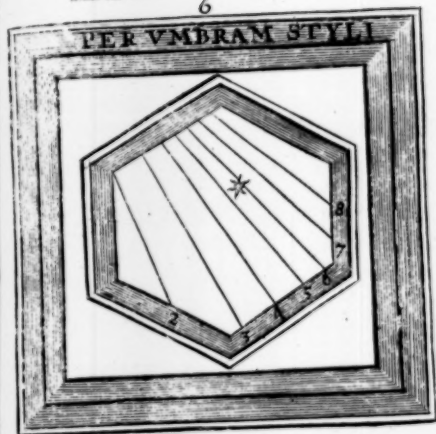
FIG. 7. The second whose tittle is, *Per umbram Horarum*; and shews the Hour by the shade of the Hours passing over the style, hath upon the glasse cover paynted à Harp, whose strings are the Hour-lines: and on the bottome is paynted à Flower de luce, whose top serves for style. Soe that by the shade of those strings passing over the Flower de luce, the Hour is known.

FIG. 8. The third, whose title is, *Per umbram tam styli quàm Horarum*, and shews the Hour as well by the shade of the Hours passing over the style, as by the shade of the style passing over the Hours, hath upon the glasse cover à Unicorne paynted with certayn little starres on his back : each of which standing for an Hours, hath its number written over it. On the bottome are drawn the Hour-lines of à Dyall, and by them à Scepter: soe that when the sunne shines you may behold the Unicornes shade being moved by the motion of the sunne, to note the Hour with the end of its Horn: and at the same time, the shade of the sayd little starres, to shew the same Hour by passing over the Scepter.

FIG. 9. The fourth and last of these, whose title is, *Sine umbra vel styli, vel Horarum*, and shews the Hour without shade of eyther style or Hours, hath paynted upon the glasse cover à Flower de luce, together with à Harp, whose strings are the Hourlines: and the top of the Flower de luce is their style. Now out of  
this



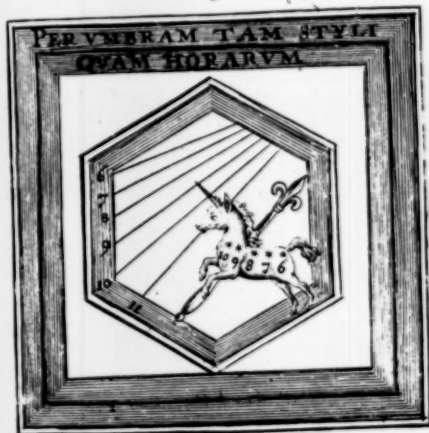
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this Flower de luce, you shall see, when the sunne shines, another Flower de luce of light, to arise, and by passing under the sayd strings of the Harp, to note the Hour: and by consequence, to shew ( as is sayd ) the Hour without shade of style or Hours.

As for the reason of the three first, there needs to adde noe more then what hath been sayd of the 20. verticall Dyalls. But concerning the 4<sup>th</sup>. the reason why the style or Flower de luce lyes in the same superficies with the Hour-lines; is, that the sayd luminous Flower de luce arising out of the paynted Flower de luce, and shewing the Hour, is reflected from a looking glasse placed upon the bottome of the Dyall.

*Of the other 4. Reclining Dyalls, Which stand upon the North Part of the Table.*

**T**He three first of these Dyalls are so contrived, that the Hour cannot be other wise known by them, then by looking through a little Ring placed on the back of the Dyall: as shall now be explicated.

FIG. 10. For in the first, whose title is, *Per Horas latentes*, yf you look on the face of the Dyall, you perceave noe Hour lines, but only a style, that is a Flower de luce paynted upon the cover: and on the contrary yf you look on the back of the Dyall through the sayd Ring, you shall see the Hour-lines, but noe style, unlesse the sunne shine: for then you shall behold the shade of the sayd Flower de luce to passe over the sayd Hour-lines, and note the Hour.

FIG. 11. In the second ( whose title is, *Per latentem styllum* ) by looking on the face of the Dyall, you behold only the Hours: that is, you see only a Crown bedecked with starres, each whereof stands for an Hour: And on the contrary by looking on

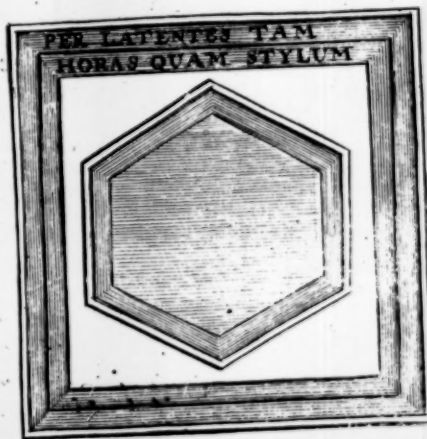
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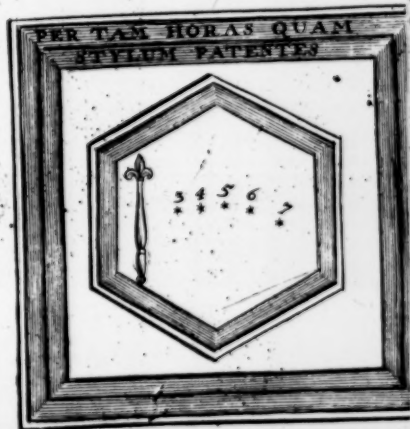
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C 2

on the back through à little Ring, you behold only the style, that is à Scepter, unlesse the sunne shine : for then you see also the shade of those starry Hours to passe over the Scepter and note the Hour.

FIG. In the third, whose title is, *Per latentes tam Horas quàm stylum*, you see neyther Hours nor style by looking on the Dyall but yf you looke (as before) on the back : you may behold the Hourlines : and yf the sunne shines, you may perceave also à little starre, to passe over them, and shew the Hour.

FIG. Lastly in the Fourth, whose title is, *Per tam stylum quàm Horas patentes*, there appeares both style and Hours : but the style is without shade, and the Hours without lines. That is upon the glasse cover are paynted certayne little starres, serving for the Hours : and à Scepter serving for style : out of which Scepter, when the sunne shines, you may behold another Scepter of light to yssue, and by passing under the sayd starres, to shew the Hour.

Now for the reason, why in the three first you cannot see the Hour, but by looking through the Ring on the back of the Dyall : it is, because their bottomes being glasse thinnely paynted over with white coulour, nothing can be seen by looking on the face of the Dyall, that is drawn on the lower side of the bottome glasse : and on the contrary, by looking on the back, nothing can be seen that is drawn upon the glasse cover, but only the shade there of, when the sunne shines.

The reason of the fourth, is the same which was given for the fourth of those, which stand on the south part of the Table.

## CHAPTER IV.

*Of the 4. glasse Boules standing on the 4. Branches  
of the first Peece.*



Hese 4. Boules shew also the usuall Hour in 4. different wayes. For one of them shews the Hour by Fire: another by Water: the third by the Aire: and the fourth by the Earth: as we shall now declare.

*of the first Boule.*

**T**He first there fore, whose title is, *Per Ignem*, and shews FIG. as is sayd, the Hour by Fire, is à little glasse Boule filled <sup>14.</sup> with cleare water. This Boul hath about 3. inches in diameter, and is placed in the middle of another Sphære of about 6. inches in diameter, consisting of severall iron Rings or circles representing the Hour circles in the Heavens. The Hour is heere knowne by applying your hand, to the sayd Hour circles, when the sunne shines: for that circle where you feel your hand burnt by the sunne beames passing through the Boule filled with water, shall shew the true Hour: according to the Latin verse there adjoined. *Cratem tange: manusque Horam tibi reddet adusta.*

The reason of this Dyall is, that the parallel rayes of the sunne passing through the sayd little Boul are bended, by the density of the water, into à cone or pyramis, whose vertex reaches à little beyond those Hour circles, and there burnes the hand applied. For soe many rayes being all united into à poynt,

must needs make an intense heat. Which heat is soe powerfull in the summer time that it will fire a peece of wood applied unto it.

*Of the second Boule.*

FIG. 15. **T**He second Boule, whose title is, *Per Aquam*, shews the Hour by water: that is by the rayes of the sunne passing through the water, with which the Boule is filled, as in the præcedēt. Which rayes although they be bended by the density of the water, as before, yet they burn not, being cutt off at their going out of the Boule, by a little white coulour layd thinnely on that part where they break out: making thereby only a round circle of light upon the sayd coulour: the center of which circles shews the Hour amongst the Hour circles, there described on the said white coulour: as the Latin verse doth also explicate, *Luminis hic centrum qui tangit, tangit & Horam.*

The reason of this Dyall (besides what we now sayd of the bending of the rayes) is, that these Hour-circles being noe other then the sections, which the playnes of the celestiall Hour-circles crossing each other in the center of the boule make in the superficies thereof: and the sayd center of the circle of light madd on te Boule, answearingt perpetually to the center of the sunne, it necessarily followes, that it shew allwayes the true Hour. As any one knowing but the first Principles of Dialling will conceave.

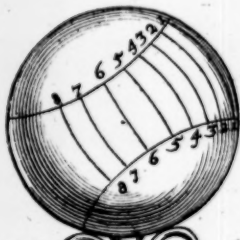
*Of the Third Boule.*

FIG. 16. **T**He Third Boule, whose title is, *Per Aërem*, and shews the Hour without any style, is only filled with Aire: and exhibites to your sight, when the sunne shines, two little pictures of

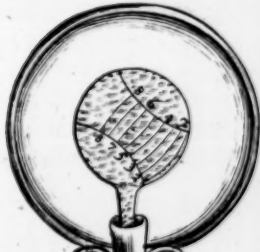
14

PER  
IGNEM

16

PER  
AEREM

15

PER  
AQUAM

17

PER  
TERRAM



of the sunne, like two small starres, within the Boule. Both which, yf by moving your eye, you bring under the same Hour-circles described on the Boule, or at least, parallel unto it, they shall shew you the true Hour; according to the there underwritten Latin verse, *Unam det geminus Sol Horam, & vera patebit.*

Now the reason, why by those little pictures of the sunne, seen both under the same Hour-circle, or parallel to it, you find the Hour, is, that those Hour circles described on the Boule, being the sections, which the playnes of the celestiall Hour-circles make in the superficies of the Boule, (as was sayd also of the second Boule) and these two little sunnes being reflected one of them from the convex superficies of the Boule, and the other from the concave: it followes by the Rules of Reflexion, that those two pictures of the sunne, are both seen in the same playn in which is also the eye which seeth, and the sunne which is seen. Wherefore since the sunne is allwayes in the playne of the true Hour-circle: it necessarily followes, that the eye behold both those pictures, at the true Hour. For although one Reflexion cannot sufficiently determine the eye to behold the sunne in the true Hour-circle: yet two reflections suffice.

Where is also to be noted, that these three Boules we have now spoke of, have this præminence above all other Dyalls depending on the shade of the style, that they shew the Hour, when by none of those others it can be discerned: that is when the sunne shines soe dimly that it casts noe perceptible shadow.

*Of the fourth Boule.*

FIG. 37. **T**HE fourth Boule whose title is, *Per Terram* shews what a clock it is in any part of the world. Which is heere performed



formed by à Geographick description of the whole earth upon the inward superficies of the Boule : together with à Meridian circle moveable upon the North and South poles: and the Æquinoctiall circle divided into its 24. Equall Hours and fastned to the sayd Meridian, at the Hour of 12. at which place also, is erected à Flower de luce: and at the North pole is fastned à thrid. The boule being thus prepared, and rightly placed: yf you turne the sayd moveable meridian till the flower de luce cast noeshade upon the Boule, and then bringing the thrid over any part of the world till it crosse the Æquinoctiall circle: yoe shall see the Hour there noted belonging to that part or parts, of the world, over which the sayd thrid passēs: according to the verse thereadjoyned: *Umbram tolle Orbi, totumque stat Hora per Orbem.*

## CHAPTER V.

*Of the 4. great Globes Standing on the first Peece.*

*Of the first Globe.*



He first therefore of these Globes, whose title is, *Horologia Geographica*, having about 13. inches in diameter, hath its superficies cutt into 32. playnes; whereof 20. are Triangles all equall and equilaterall. The other 12. are Pentagones or fiveangled figures, all of them likewise equall one to another. Some of these Pentagones are made hollow like Hemisphares, others

others like cones, the rest, as also the Triangles, are left playne. The Dyalls described as well on the Pentagones, as on the Triangles have for style, a sharp poynted iron perpendicularly erected.

The Dyalls described on the Pentagones shew not only the situation, of the more remarkable countryes in the world, but also what severall actions, are performed in them, at the same time: for example, who are now at Dinner, who at supper, who are rising, who sleeping, &c.

FIG. 18. For those two, whose title is, *Tempus surgendi*, shew by the shade of the style in what part of the world it is time of Rising, or 6. a clock in the Morning.

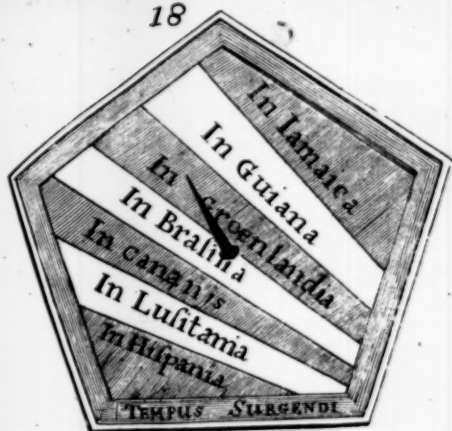
FIG. 19. Those, whose title is, *Tempus Prandendi*, shew in the same manner, in what part of the world, it is time of Dining or Midday.

FIG. 20. Those whose title is, *Tempus Cœnandi*, shew in what country it is supper time, or 6. a clock at night.

FIG. 21. Those, whose title is, *Tempus Dormiendi*, shew where it is Midnight, or time of sleeping.

But those two, whose title, *Habentes Solem supra caput*, shew by the shade of the style what people, whether by sea or land, have the sunne just over their Heads at such time as you look upon the Dyall. Which is performed by inverting that part of the Terrestrial Globe, which is included between the two Tropicks. The reason of which inversion is, that the shade of

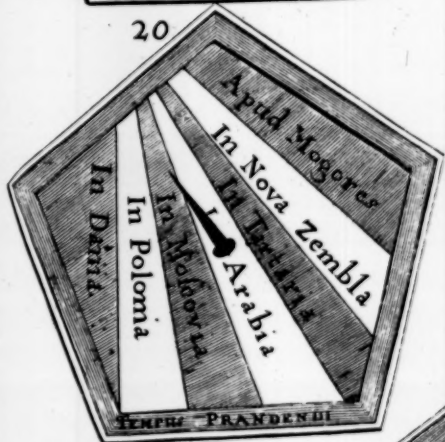
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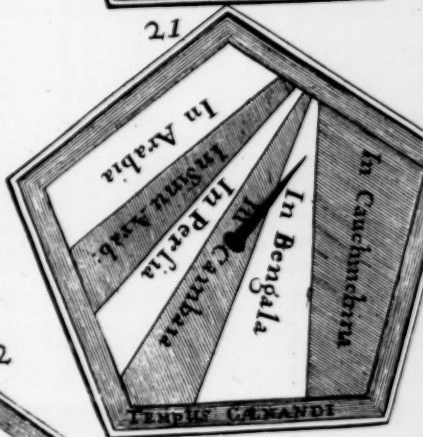
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20



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22



of the style being allwayes cast towards the contrary part to the sunne, that is, yf the sunne be East, the shade falls towards the West, &c. it was necessary the eastern part of the world should heere lye Westwards; and the Northern Southwards. And thus much for the 12. Pentagones, described on the Globe.

Now for the 20. Equilaterall Triangles: the Dyalls described on them, shew only what à clock it is in this or that particular place, according to the usuall way of counting the Hours from Midnight to Noone, and from Noone to Midnight whereof only three examples are heere sett downe. For example, one of these Dyalls shews what à clock it is at Jerusalem: another at Constantinople: another in Jamaica, &c.

*Of the second Globe.*

THE second Globe, whose title is, *Horologium Astronomicum ostendens*, &c. is just like the former, whereof we have now spoken: that is the superficies thereof is cutt into 12. Pentagones and 20. Triangles. But the Dyalls, described on these Pantagones and Triangles, are much different from those of the former. As not shewing the Hour of the day: but divers other things belonging to Astronomy, as the Azimuth or distance of the Sunne from the South: The Almicanrarath, or Height of the Sunne above the Horizon: what Hour he rises and setts: and the like as shall now be sayd.

23



24



FIG. 25. First therefore the Dyall, whose title is, *Azimuth Solis à Meridie*, shews by the shade of the style ( which in each Dyall heere also is perpendicularly erected ) how many degrees the Sunne is distant from the true South, at such time as you looke upon the Dyall. The lineaments of this Dyall, are noe others then the sections, which the playnes of the verticall circles crossing Each other on the top of the Style, make with the superficies of the Dyall.

FIG. 26. 2. The Dyall whose title is, *Altitudo Solis supra Horizontem*, shews how many degrees the Sunne is elevated above the Horizon. The lineaments of this Dyall are the Sections which the superficies of the Dyall makes with those Cones whose bases are parallel to the Horizon, and whose common vertex is the top of the style: or center of the Earth.

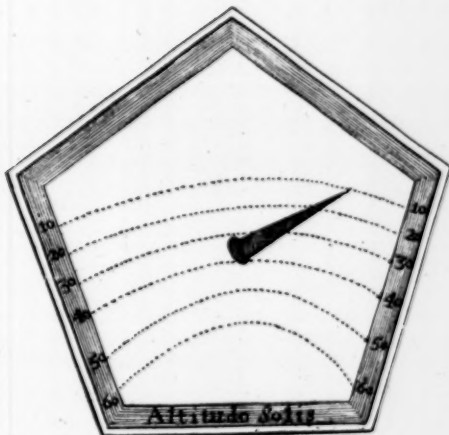
FIG. 27. 3. The Dyall, whose title is, *Incipit Aurora*, shews at what Hour begins Break of Day, that is when first the Crepusculine Arch begins to appeare. The lineaments by which this is heere performed are the Sections, which the superficies of the Dyall, makes with the Cones, whose bases are parallel to the Equator, and whose common vertex, is the top of the style, or Earths center.

FIG. 28. 4. The Dyall, whose title is, *Sol Oritur*, shews by the now named Sections of those cones, whose bases are parallel to the Equator, at what Hour the Sunne riseth: and by consequence, when he sets.

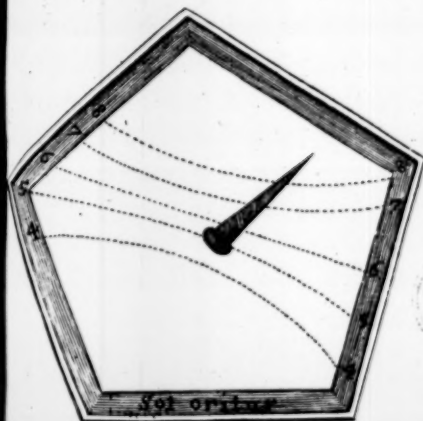
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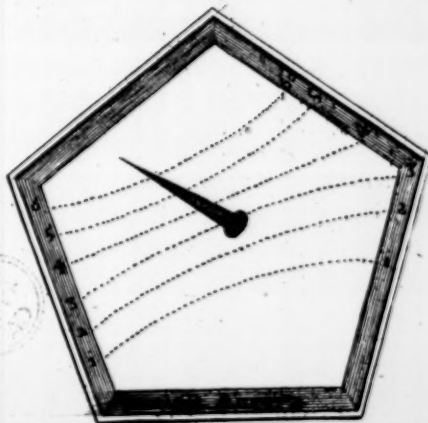




FIG. 5. The Dyall, which hath for title, *In quo signo Zodiaci sit*  
 29. *Sol*, shews by the sayd sections of the superficies of the Dyall  
 & with the cones, whose bases are parallel to the Equator,  
 30. in what part or signe of the Zodiack the Sunne is. But  
 because the shade, of the top of the style falls twice every  
 yeare, upon the same section, by reason of the Sunnes as-  
 cending and descending from the one Tropick to other:  
 therefore to avoyd confusion, heere are two Dyalls, of the  
 same sort, one serving from the 10<sup>th</sup>. of December to the  
 10<sup>th</sup>. of June : the other from the 10<sup>th</sup>. of June to the  
 10<sup>th</sup>. of December.

FIG. 6. The Dyall, whose title is, *Dies Mensis* shews by the like  
 31. conicall sections now mentioned, what Day of the month  
 & it is: at least, as neere as can be expected in soe little a for-  
 32. me. Heere are likewise two Dyalls of the same sort, for  
 the reason now mentioned. And these Dyalls which in this  
 second Globe, we have hitherto spoken of are all of them  
 described on the Pentagones. Those which follow are de-  
 scribed on the Triangles.

7. The Dyall, whose title is, *In qua parte Horizontis incipiat*  
 FIG. *Aurora*, shews in what part of the Horizon begins the Break  
 33. of the Day: that is, in what part thereof begins first to appeare  
 the convex part of the Crepusculine Arch: Whether just in the  
 East, or in the North East, or South East, &c. And by conse-  
 quence, in what part also the Evening Twilight Ends. The li-  
 neaments of this Dyall, are the Sections which the playnes of  
 the verticall circles crossing Each other on the top of the style,  
 Make with the playne of the Dyall.

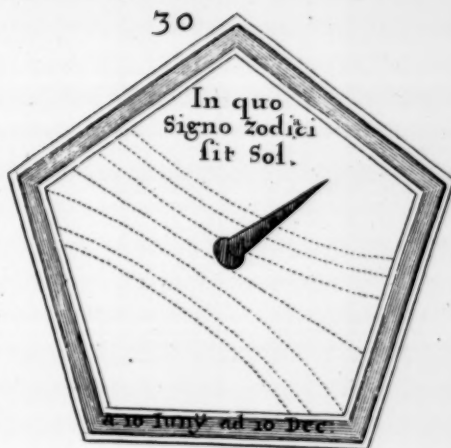
8. The Dyall, whose title is, *Duratio Crepusculi*, shews by  
 FIG. the now often mentioned Conicall Sections of the superficies  
 34. of the Dyall, with the Cones whose bases are parallel to the  
 Equator, How long, as wel the Morning, as Evening Twilight  
 doth



29



30



31



32



33



34



E

doth last: That is, how many Hours are from Breacke of Day till Sunne Rising: and from Sunne setting to the End of Twilight, or till dark night.

FIG. 9. The Dyall, whose title is, *In qua cæli plaga existat Sol*,  
35. shews by the Sections of the Verticall circles, see n.7. in what part of the Heaven the Sunne is: Whether in the East or West, outh East, or South West, &c.

FIG. 10. The Dyall, whose title is, *Amplitudo Ortiva Solis*, shews  
36. by the Conicall Sections Mentioned n.3. how many Degrees the Sunne rises wide of the true East poynt whether towards the North, or towards the South.

FIG. 11. The Dyall, whose title is, *Quot Horæ restent ad occasum*  
37. *Solis*, shews by the Sections of the Italians (see c. 2. n. 3.) Hour circles with the superficies of the Dyall, How many Hours rest till Sunne sett.

FIG. 12. The Dyall, whose title is, *Quota pars Diei sit Elapsa*, shews  
38. by the Sections of the Unequall (see ibid. n.3.) Hour circles, what part of the Day, or space from Sunne Rising to Sunne setting is now spent, whether the third, or fourth, or fift, &c.

FIG. 13. The Dyall, whose title is, *Declinatio Solis* shews by the  
39. Conicall Sections Mentioned n. 3. the Sunnes Declination: that is how many Degrees he is distant from the Equator.

FIG. 14. The Dyall, whose title is, *Qua Hora Sol perveniat ad*  
40. *verum Orientem*, shews by the same Conicall Sections, at what Hour the Sunne comes to be just East: and by consequence, at what Hour after dinner he wilbe just West.

15. The

35



36



37



38



39



40



FIG. 15. The Dyall, whose title is, *Refractio Solis*, shew by the  
41. Conicall Sections spoken of n. 2. the Sunnes Refraction; that  
is how many minutes he appears to be Elevated above his true  
height, by the bending of his rayes in passing through our  
thick Atmosphere.

FIG. 16. The Dyall, whose title is, *Quoties umbra contineat Cor-*  
42. *pis Erectum*, shews by the shade of the stile falling upon the  
aforesayd Conicall Sections Mentioned n. 2. how often the  
shadow of a body perpendicularly Erected upon a playn parallel  
to the Horizon containes the length of the same body.

FIG. 17. The Dyall, whose title is, *Longitudo Diei*, shews by the  
43. shade of the Style falling upon the Conicall Sections spoken of  
n. 3. the length of the Day: that is, how many Hours are be-  
tweene sunne rising and setting.

FIG. Lastly, the Dyall, whose title is, *Quot sint Hora Elapsa ab or-*  
44. *tu Solis*, shews, (by the shade of the stile falling upon the Sec-  
tions, which are made in the superficies, of the Dyall, by the  
playnes of those circles, which divide all the parallels of the  
Sunnes dayly, motion into 24. Equall parts: according to  
what was sayd c. 2. n. 2.) How Many Hours have passed since  
Sunnes Rising.

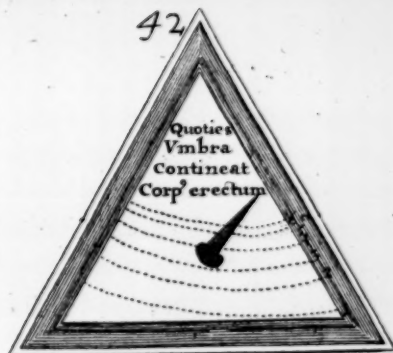
*Of the Third Globe.*

THE Third Globe, whose title is, *Horologium Uranographi-*  
*cum*, is about the same bignes with the two former: but  
the superficies, thereof cutt into 20. Triangles, all Equall  
and Equilaterall: some whereof are made hollow like Cones;  
the rest left playne. The Dyalls described on these Triangles,  
shew what situation or posture, the Heavens have at any time  
of the Day, when the sunne shineth: that is, what starres are  
rising, what setting, what stand just over your Head, &c. See  
this

41



42



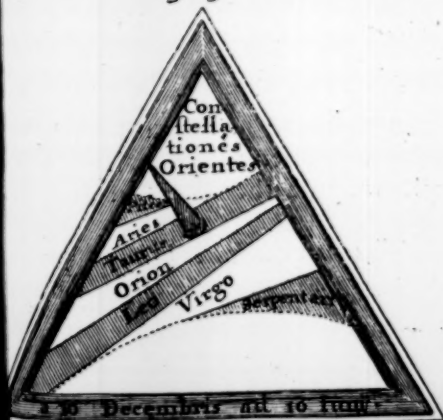
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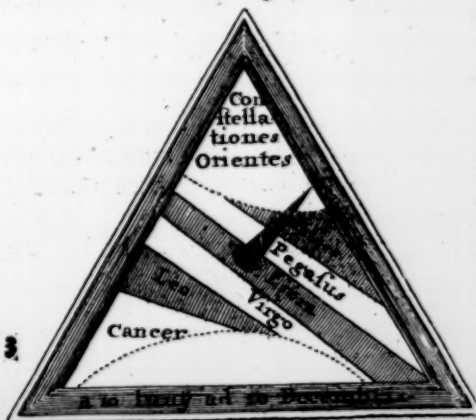
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46



E 3

a 10 Decembris ad 10 Junij

a 10 Junij ad 10 Decembris

this Globe standing immoveable, performes, by the shade of the styles belonging to these severall Dyalls, that in effect, which a Cælestiall Globe, whereon all the Fixed Starres, or Constellations are paynted, would doe, if being rightly placed, it were continually turned about, according to the sun-  
de dayly Motion: where is to be noted that heere are allwayes two Dyalls of Each sort, one serving one half yeare, and the other another, for the reason given in the fift Dyall of the second Globe.

First therefore those two Dyalls, whose title is, *Constellatio-  
nes Orientes*, shew by the shade of the style, what constella-  
tion, or company of starres, begin then to rise above the Ho-  
rizon: provided that you looke upon the Dyall belonging  
to the time of the yeare in which you are in according to what  
was now sayd, The lineamēts of these Dyalls, are the Sections,  
which the playne of the Ecliptike circle makes with the su-  
perficies of the Dyall, at such time, as those severall constel-  
lations, noted upon the Dyall, begin to rise.

2. Those two, whose title is, *Constellationes Occidentēs*, shew in like manner, what Constellation begins then to sett, or goe under the Horison. The lineaments of these two Dyalls, are the Sections, which the playn of the Ecliptike circle makes with the superficies of the Dyall, at such time, as this or that constellations begins to sett.

3. Those two Dyalls, whose title is, *Constellationes existentes in Meridie*, shew what Constellation begins to passe the Meridian circle, or full South. Which is heere performed by the Sections, which the playne of the Ecliptike circle makes with the superficies of the Dyall, when the severall Constellations there noted, begin to passe the Meridian circle.

4. Those two, whose title is, *Constellationes existentes in ipso Oriente*,

*Oriente*, shew what Constellations stand just East, whether it be in the Horizon, or elevated above the same. Which they performe by those Sections, which the playne of the Ecliptike makes with the playne of the Dyall, when Such Constellations, as are there noted, doe passe the East circle, or first Verticall.

3. Those who, whose title is, *Constellationes existentes in ipso Occidente*, shew on the contrary what Constellations stands just West. Which is done by the like Sections made by the Ecliptike, when those Constellations begin to passe the true West.

6. Those two Dyalls, whose title is, *Constellationes existentes supra Caput*, shew what Constellation stands, over your Head. Which is also done by the à fore sayd Sections, made when the Constellations there noted, passe the Zenith, or verticall poynt.

Now these 12. Dyalls being all made (as is sayd) by the Sections of the Eccliptike with the superficies of the Dyall: it will be sufficient to give heere à Diagramme of the two first.

But because these 2. Dyalls shew only what situation the starres, have in the Day time, when the starres cannot be seen, unless there should happen à torall Eclipse of the Sunne: there are therefore described on the same Globe 6. other Dyalls, shewing what situation the starrs will have at 8. à clock at night; à time proper, to behold them and see the truth of the Dyall.

Wherefore



Wherefore 7<sup>o</sup>. Those two Dyalls, whose title is, *Constellationes existentes in Oriente Horâ octavâ Vespertinâ*, shew what  
 FIG. 47. Constellation will stand just Eastward at 8. a clock at night.  
 &c.  
 48. Which is heere performed, by the Sections, which the superficies of the Dyall makes with those cones, whose bases are parallel to the Equator, and whose common vertex is the top of the stile. Or center of the Earth.

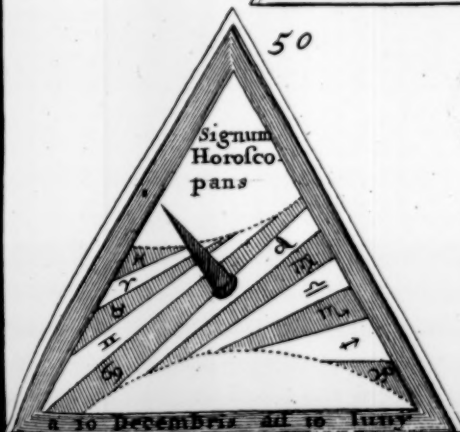
8. Those two, whose title is, *Constellationes existentes in Occidente Horâ octavâ Vespertinâ*, shew by the now named sections, what Constellation will be just Westward, at 8. a clock in the Evening.

Lastly those, two, whose title is, *Constellationes existentes in Meridie Horâ octavâ Vespertinâ*, shew by the sections, which their superficies make with there aforesayd Cones, what Constellation, at 8. a clock at night, will be just South. And these 6. Dyalls being all made by the Sections of the same Cones, it will suffice to place heere the Diagramme of the two first. And thus much of the Third Globe.

*Of the fourth Globe.*

THE fourth and last Globe, whose title is, *Horologium Astro-nomicum*, is also cutt into 20. Triangles equall and Equilaterall, just like the precedent. The Dyalls described on these Triangles, belong to Astrology: and are placed heere for those who are delighted with such conjecturall uncertayntyes. These Dyalls are as followeth.

FIG. 49. 1. The Dyalls, whose title is, *Domus Astrologica Salus*, shews in which of the 12 Astrologicall Houses described according to the way of Regiomontanus, the Sunne is, at the time you behold the Dyall. The lineaments of this Dyall, are the sections which the playnes, of those circles, which crossing Each other  
 on



on the North and South poynts of the Horizon, divide the Equator into 12. Equall parts, beginning at the East poynt of the Horizon, and soe descending, make with the playne of the Dyall.

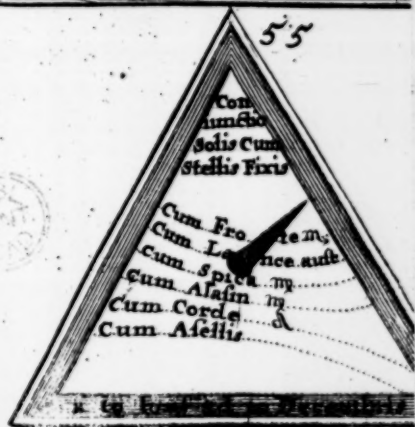
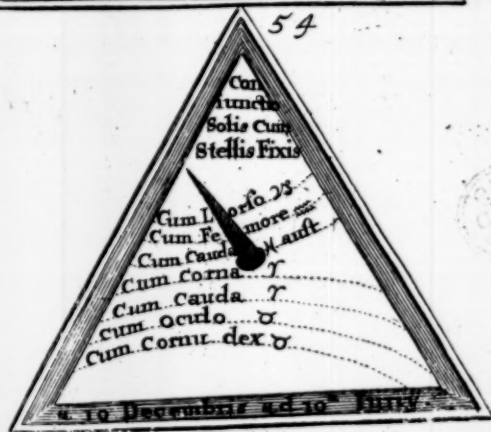
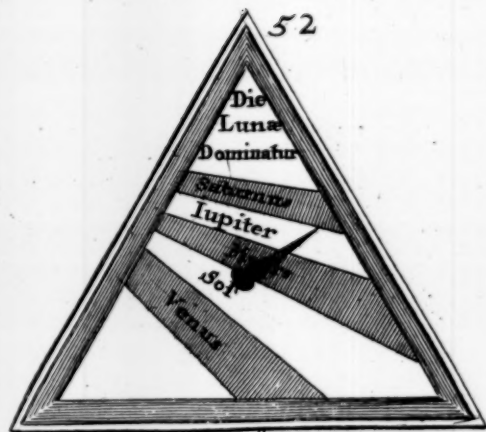
FIG. 2. Those two Dyalls, whose title is, *Signum Horoscopus*,  
50. shew the Horoscopon (as Astrologers terme it) that is which  
& of the 12. signes doe begin to rise above the Horizon. Which  
51. is heere performed by the Sections, which the playne of the  
Ecliptike makes at the time they begin to rise, with the superficies of the Dyall.

3. Those, whose title is, *Signum Culminans* shew by the like sections of the Ecliptike with the superficies of the Dyall, what Signe, of the Zodiack is in the Meridian, or full South. Wherefore these 4. Dyalls being made by the same sections, it suffices also to put a Diagram only of the two first.

4. Those Dyalls, which heere serve for the severall dayes of the weeke shew what Planet raignes, according to the opinion of auncient Astrologers, Every Hour of that Day. Soe  
FIG. the Dyall, whose title is, *Dominatur die Luna*, shews what  
52. Planet raignes at any time of the Day on Munday. And in the  
FIG. same Manner, the Dyall, whose title is, *Dominatur die Martis*  
53. shews what Planet raignes at any time on Tuesday. And soe of the rest. The lineaments of these Dyalls, being all alike, to witt the sections, which the playnes of the Unequall Hour circles make with the superficies of the Dyall; it will be sufficient also to put heere the Diagrams of the two first.

5. Those two Dyalls, whose title is, *Conjunctio Solis cum Stellis*  
FIG. *Fixis*, shew with which of the more remarkeable fixed starres  
54. the Sunne is in conjunction; or under the same circle of  
& longitude.  
55.

Lastly those two, whose title is, *Varii Aspectus Solis cum Stellis Fixis*, shew the other Aspects of the Sunne, as the Trine Aspect




pest, the Quadrat, &c. with the sayd Fixt starres. These 4. Dyalls being much alike, as made by the sections, which the superficies of the Dyall makes with the cones whose bases are parallel to the Equator, and common vertex is the top of the stile, or center of the Earth, it will suffice to place heere also the Diagram of the two first. And thus much of the Dyalls belonging to the first Peece.

## THE SIXTH CHAPTER.

### *Of the Dyalls described on the Edge of the second Peece.*

FIG.  
56.  
&  
57.

1.  Those Dyalls, which described on the Edge of this Table, have for title, *Stella Orientes Cosmicè*, shew what starre rose Cosmically, (that is to say, rose at the same time when the Sunne rose) on the Day you looke upon the Dyall: provided you looke upon the Dyall belonging to the time of the yeare: heere being two Dyalls of the same Sort, one for the one half of the yeare, and another for the other half.

2. Those Dyalls, whose title is, *Stella Orientes Acronicè*, shew what starre will rise Acronically; that is, will rise just at Sunne setting. Where also care is to be had, that you looke upon the Dyall agreeable to the time of the yeare.

Lastly, those Dyalls, whose title is, *Stella Orientes Heliacè*, shew what starres rise that Day Heliacally: that is what starre which for some time before had by reason of its nearnes to the Sunne, lay hid, beginns now to appeare agayne,  
by

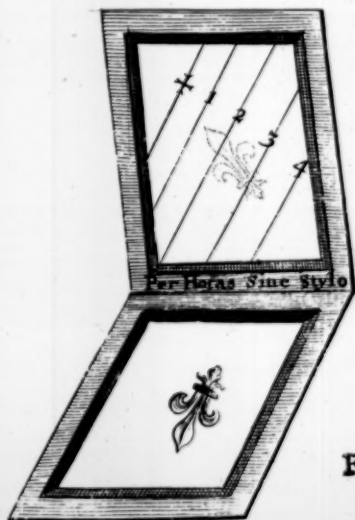
56



57



58



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59



by getting out of the sunne beames.

Now the lineaments of these Dyalls being all of the same sort: to witt such Conicall sections, as the playne, of the Dyall makes with those Cones, whose bases are parallel to the Equator; and whose common vertex is at the top of the style, that is at the middle of the little paynted starre, which heere in Each Dyall represents the style: This I say being soe it will suffice to place heere two Diagrams of the first sort.

## THE SEAVENTH CHAPTER.

*Of the 8. Reflecting Dyalls placed on the top of the second Table.*



He reason why these Dyalls placed upon the second Table were made by reflexion of looking glasses, was not soe much for variety as for necessity. For the Table Standing high, the Dyalls placed on the upper part thereof, could not have been seen, but by being reflected on the bottome or inclining playnes of the great Globe, which stands (as in sayd in the first Chapter) upon this second Table. Whereas now being reflected they are very well seen upon the sayd bottome, together with their titles, as followeth.

- FIG. 1. The Dyalls, whose title is, *Per Horas sine stylo*, hath its  
 18. Hour-lines described and visible on the bottome of the a fore sayd Globe; but by the style which is a Flower de luce, being paynted upon a looking, glasse placed on the Table, appeares not: but only the shadow thereof appeares: which being reflected



reflected upon the sayd Hour-lines drawn on the bottome of the Globe, shews the Hour: according to the verse there ad-joyned. *En Horas! stylus à lucenti Sole petendus.* These Hourlines being noe other then the sections which the playnes of the ordinary Hour circles, crossing Each other upon the top of the sayd Flower de luce, make with the playn of the Dyall, there needs say noe more but that it is à Reflex Dyall, supposing allwayes the Sunne as much depressed under the Horizon, as it is defacto Elevated above it.

2. The Dyall, whole title on the contrary is, *Per stylum sine* FIG. *Horis*, hath its style (which is à Lions paw) paynted upon the <sup>59</sup> bottome of the Globe: and therefore easy to be seen: bur the Hour-lines being drawn upon à looking glasse placed upon the Table, appeare not: only their shadow reflected upon the sayd Lions paw shew the Hour: according to what the verse there intimates, *Da mihi Phæbe Horas: Horamq; tibi ungue notabo.* This Dyall being only the former inversd, according to what was sayd of the like inversion in the second Chapter, there needs adde noe more. As also neyther is it needfull to say any more of the other, which there in the self same manner shews the Hour by the Hour-lines reflected upon the end of an Unicornes Horne: according to the verse: *Sol mihi luce dat Horas, Horam do tibi Cornu.*

3. In the Dyall, whose title is, *Sine Horis vel stylo*, appeare neyther Hour-lines nor style, unlesse the Sunne shine: for then you see them both: that is you see the shadow of both style and Hour-lines reflected from the looking glasse upon which the sayd Hour-lines are drawn. This Dyall differing nothing from an ordinary Reclining Dyall Declining we need say noe more thereof: as neyther of the other 4. which also differ noe otherwise from ordinary Dyall, then that they are not to be otherwise seene then each of them in à looking glasse placed  
on

On the bottome of the great Globe. Wherefore it will suffice to place the Diagrams of the two first.

## THE EIGHTH CHAPTER.

*Of the 4. Dyalls supported by the 4. Branches of the second Peece.*



Hese 4. Dyalls are drawn Each of them upon à glasse Boule of about 3. Inches diameter : and shew the usuall Hour , by 4. different wayes. Viz. by à shade without any style : by à style without any shade : by à style and shade : and without cyther style or shade.

FIG. 1. The Dyall , whose title is , *Per stylum sine umbra* , shews  
60. the Hour by moving the style , ( which heere is à Flower de luce fixed on à moveable Æquator ) to and fro till it cast noe shade upon the Boule : which being done , the Hour sought for shall stand just under the style ; as the verse there added declares : *Nulla sit umbra stylo : Veram stylus indicat Horam*. Now the reason , why the style casting noe shade on the Boule , stands over the true Hour , is , that these Hours lying all in the sections , which the playnes of the Hour circles make in the superficies of the Boule , it is necessary , that then the top of the style be in the playne of the same Hour circle , in which at that time is also the center of the Sunne.

FIG. 2. In the Dyall , whose title is , *Per umbram sine stylo* ,  
61. the Hour is found by observing , where the part of the Boule Enlighthened by the Sunne meetes with the part not  
En.

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61



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63



Enlightened: for this meeting shews the Hour; as the there adjoynd verse Explicates: *Vis Horam? lucemq; inter, tenebrasque require.* The reason whereof is, that the Sunne by reason of its immense distance Enlightening without any considerable difference, the one half of the Boule, and the Hour poynts being all noted in the Equator of the Boule, or section which the playne of the Equator passing through the center of the Boule, makes in the superficies thereof, the sayd termination of light must needs fall upon the true Hour poynt, provided that the Dyall be once rightly placed.

FIG. 3. The Dyall, whose title is, *Per stylum & umbram*, shews  
 62. the Hour by the shade of à style perpendicularly Erected upon the superficies of the Boule and therefore differs nothing from an ordinary Dyall described on the convex superficies of à Globe; There are three Such Dyalls placed upon this Boul, to the End, that when the shade of the style ceases, by reason of the convexity of the Boule, to shew the Hour in one, may shew it in another.

FIG. Lastly the Boule, whose title is, *Sine stylo vel umbra*, shews  
 63. the Hour without Eyther style or shadow: for yf you place your self soe as to behold your face in the Middle of the little convex looking glasse which is there paced on the South pole of the Boule, you shall at the same time, if the Sunne shine, behold the picture thereof at the true Hour: according to the verse, there adjoynd: *Speſtantiſ Speculum, Horam dat tibi Solis imago.* The reason whereof is, that the Eye when placed, as is sayd, being in the Axis of the World: and by consequence, in the playne of all the Hour circles, and therefore in the playne of the true Hour circle: in which playn also the center of the Sunne being necessarily placed, it followes that the sayd picture  
 of

of the Sunne appeare at the true Hour : since by the Rules of Reflexion , the Eye seeing and the poynt seen , are in the same playn with the poynt of the Reflexion.

As for the Hour-lines of these 4. Dyalls, they are noe other then the sections or some poynt of them , which the playnes of the Hour circles makes in the superficies of the Boules. Which playnes in the first, second and fourth , crosse Each other in the center of the Boule : but in the third , they Crosse one another at the top of the stile.

## THE NINTH CHAPTER.

*Of the Dyalls described on the great Globe which stands on the second Table.*



His Globe having 8. Reclining Playnes. 8. Inclining , and 8. Upright playnes : The Dyalls described on them are as followeth.

1. Six of the 8. Upright playnes being made hollow like those 20. on the Edge of the first Table, are covered also with glasse, and Dyalls described on them , just like those 20. the difference only being , that heere the bottomes are also covered with glasses thinnely paynted over with white colour, to the End the Dyalls may be seen as well within the Globe , as without : To which purpose , two of these upright playnes , looking towards the North , are covered only with cleare glasse , as Serving for windows to look into the Globe. On the sayd bottome glasses, are drawn seve-

rall pictures, as of their Majestyes ; the Queen Mother ; the Duke of York. Prince Rupert , &c. In his Majestyes picture the Hour is shewne by the shade of the Hour-lines passing over the top of the Scepter : In the pictures of the two Queens, it is shewn by the like shade passing over the top of a Flower : and in the other three, by passing over the end of a troncheon, which each of them hold in their hands. Under each picture is written a Chronograph for the yeare 1669. in which the Dyall was sett up : and Sutable to the person. Which Chronographs, according to the order now named, are as followeth.

1. regnet DIV CaroLVs IMPeretqVe BRITANNIs.
2. FAXIt regIna Det regl regnoqVe proLeM Catharina.
3. regIna Mater nato sibi CaroLo DIV frVatVr.
4. IaCobVs & regls frater, & InsIgnls BRITANlę ADMIRA LIVs.
5. FILIVs seCVnDVs regls boheMIA.

These 6. Verticall Dyalls being all alike it will suffice to place heere the Diagrams of the two first.

FIG.  
64.  
&  
65.

As for the Dyalls described on the Reclining playnes of this Globe, they are in substance like those Recliners placed upon the first Table : Except that, whereas those of the first are most of them made to shew the Hour by looking on the outside of the Dyall : heere noe Hour can be scene but by looking through the afore sayd windows in to the Globe : which doing, you shall behold in one a starre, in another a Flower de luce shewing the Hour, by passing over the Hour-lines : in a third you shall behold a Lion with certayn starres on his back, each where of represents an Hour, to passe under a cloud, and soe by  
suc.





ſucceſſively hiding them , to note the Hour: and the like of the reſt of theſe Recliners. As for the inclining playnes, which are placed on the bottome of the Globe; the Dyalls belonging thereto are already Explicated in the precedent Chapter, as made by reflexion of looking glaſſes, &c.

## THE TENTH CHAPTER.

*Of the 4. glaſſe Boules ſupported by the foure Branches of the great Globe.*



Ut of the top of the great Globe yſſue (as was ſayd in the firſt Chapter) foure Branches each bearing à glaſſe Boule like thoſe of the firſt and ſecond Peece: but ſomewhat leſſe in proportion to the Pyramis. Theſe 4. Boules are guilded over except where the Hour lines are drawn: which is thinnly paynted over with white colour: to the end the Sunne beames paſſinge through à little ſtarre left cleare on the top of the Boule, and making the like ſtarre of light upon the Hour lines may be ſeen to note the Hour. Theſe Dyalls ſhew the Hour according to the different wayes of numbring the Hours, uſed by ſeverall Nations, as was ſayd in the ſecond Chapter.

FIG. 1. The Dyall, whoſe title is, *Per Horas Italicas*, ſhews by the  
66. ſayd luminous ſtarre paſſing over the Hour-lines, what Hour it is to be ſayd according to the Italian account, which numbers from Sunne ſett to Sunne ſett 24. Hours. Theſe Hour-lines are the ſections, which the playnes of the Italian Hour circles croſſing Each other in the middle of the ſayd ſtarre placed on the top of the Boule, make in the ſuperficies thereof.

2. The

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licus

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Per  
Horas Ba  
bylonica

68



Per  
Horas Ast  
ronomicas

69



Per  
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tiquas

2. The Dyalls, whose title is, *Per Horas Babylonicas*, shews in like manner, what Hour it is according to the Babylonians way of reckoning, who count 24. Hours from Sunne Rising till next Sunne Rising. Which it performs by the sections which the playnes of the Babylonian Hour circles crossing Each other in the middle of the sayd starre, make in the superficies of the Boule.

FIG. 67. 3. The Dyall, whose title is, *Per Horas Astronomicas*, shews by the like starre, the Hour according to the Astronomicall account, which numbers, 24. Hours from Noon till next Noon. This Dyall is made by the like sections of the usuall Hours circles crossing Each other in the middle of the sayd starre: The numbers sett to the Hours being only different: that is, one a clock in the morning is heere called 13. and two, 14. three a clock, is called 15. &c.

FIG. 68. Lastly the Dyall, whose title is, *Per Horas Antiquas, five Judaicas*, shews the Hour according to the Ancient way of numbring the Hours: Viz. counting allwayes 12. Hours from Sunne Rising till the setting thereof. Wherefore the sections by which this Dyall is made, are those which the playns of the unequall Hour circles make in the superficies of the Boule: which playns also crosse each other in the middle of the starre, or style of the Dyall. And thus much of the Third peece, with the Branches belonging to it. The Diagrams of these 4. Boules are as followeth.

## THE ELEVENTH CHAPTER.

### *Of the three Vppermost Peece of the Pyramis.*

**T**He Dyalls belonging to the three lower Peeces of the Pyramys, being Explicated in the precedent Chapters, we will now in this Chapter Explicate the rest, that is, the Dyalls appertayning to the three highest, or uppermost part thereof.

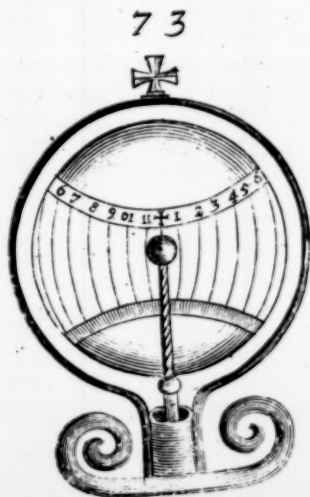
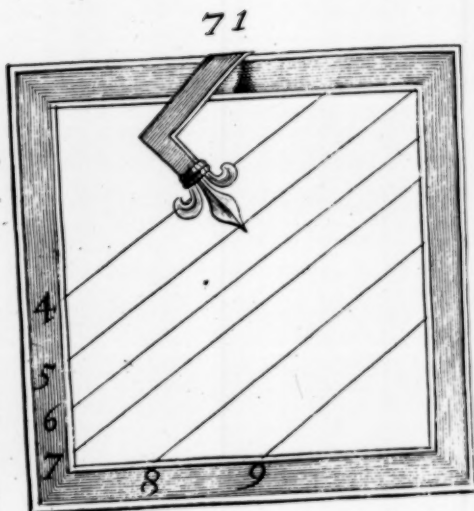
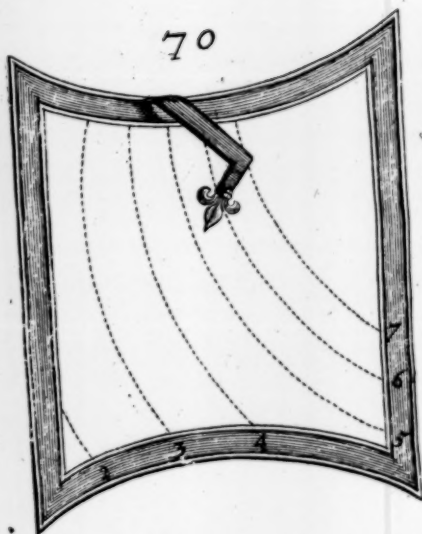
The fourth Peece, therefore, consisting, (is is sayd in the first Chapter) of 12. Concave Semicylinders, and Standing upon the Great Globe held up by 4. Supporters, like those <sup>Fig.</sup> which hold up the second Peece, but lesse: hath upon Each <sup>70.</sup> of those Semicylinders à Dyall described shewing the usuall Hour by the shade of à Flower de luce fixed at the top of the Semicylinder. Out of the top of this Peece ys sue 4. Branches carrying Each à little glasse Boul, shewing also the usuall Hour by the light of the Sunne penetrating through the Hour-lines (which for that purpose are left transparent, the rest of the Boul being guilded over) and passing over à little starre paynted on the lower part of the Boul.

The first Peece, consisting of 8. playn Triangles Equall and <sup>Fig.</sup> Equilaterall: and six Equall Squares and held up also by 4. <sup>71.</sup> Supporters, hath in like manner Dyalls described thereon shewing the usuall Hour by the shade also of à Flower de luce.

The sixt and last Peece, or top of the Pyramis, is à great <sup>Fig.</sup> glasse Boul Standing upon the fift, supported by à foot of 73.

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iron,



iron, and Encompassed with two iron circles having on the top à Crossè. This Boul also shews the usuall Hour by the shade of à little golden Ball placed in the middle of the Glasse. The Dyalls belonging to these three peecees, shewing only (as is sayd) the usuall Hour: it will suffice to sett down à Diagram for Each peece.

As for the reason of these Dyalls, they all shewing only the usuall Hour, there needs say noe more, then what hath already been sayd of the like, Viz. that in the 4<sup>th</sup>. and 5<sup>th</sup>. peece, the playnes of the Hour circles Crossè each other upon the top of the Flower de luce: but in the 6<sup>th</sup>. they Crossè on the center of the little Ball placed in the middle of the great Boule. The Dyalls of the 4. little Boules supported by the branches, are noe other then the Astronomicall Dyall of the precedent Chapter inverted, and only differre in the numbers sett to the Hours. And thus much concerning what in this Short Tract was intended, to witt the use and reason of the Dyalls described on the sayd Pyramis.

END.

GEORGIUS GRAIUS SOCIETATIS JESU,  
*Provincia Anglicana Præpositus Provincialis.*

CUM P. FRANCISCI LINI, Societatis nostræ Explicationem Horologii erecti in Horto Regio anno 1669. tam Latinè, quàm Anglicè scriptam tres ejusdem Societatis Theologi, quibus id commissum fuit, recognoverint, atque in lucem edi posse probaverint, potestate acceptâ ab Admodum Reverendo P. nostro Joanne Oliva ejusdem Societatis Præposito Generali, Facultatem concedimus, ut typis mandetur, si ita iis ad quos pertinet videbitur. In quorum fidem has litteras manu nostrâ subscriptas, & Sigillo nostro munitas, dedimus Londini 24. Martii 1673.

GEORGIUS GRAIUS.

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PERMISSIO.

Permittimus ut explicatio Horologii erecti in Horto Regio anno 1669. per Patrem FRANCISCUM LINUM, Societatis JESU scripta, tam Latinè quàm Anglicè, typis detur. Leodii 9. Aprilis 1673.

JO. ERNESTUS BARO DE SURLET,  
*Vicarius Generalis Leodienfis.*

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ERRATA.

pag. 1. l. 4. Majestey. Majestyes. p. 1. l. 7. Majestey. Majestyes. p. 4. l. 10. Hour. Hour. p. 11. l. 15. darkores. darknes. p. 16. l. 16. thes had. the shade. p. 16. l. 26. little. title. p. 18. l. 14. hof. of. p. 22. l. 13. circles. circle. p. 22. l. 22. madd on te. made on the. p. 25. l. 19. or. of. p. 30. l. 4. south. south. p. 32. l. 7. to other. to the other. p. 34. l. 7. outh. south. p. 38. l. 6. funde. Sunnes. p. 40. l. 14. there. the. p. 40. l. 20. Astronomicum. Astrologicum. p. 48. l. 8. diamether. diameter.



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